

Appendix H

Fate and Transport Tables

Table H.1

Environmental Fate and Transport Criteria

PERSISTENCE: The tendency of a chemical substance to persist (survive) in the environment without transformation into another chemical form.

| PERSISTENCE | | |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <u>Measure (Potential Utility)</u> | <u>Comment</u> | <u>Regulatory Endpoint</u> |
| Hydrolysis Half-Life | Degradation in water. Measured at pH 5, 7, and 9 (acidic, neutral, and alkaline) at 25° C using ¹⁴ C material. | Half-life > 25 weeks |
| Aerobic and anaerobic soil metabolism | Degradation due to the biological and physical/chemical properties of the soil. Uses radiolabeled material. The specific metabolites are identified, and persistent ones could require additional toxicology, ecotoxicity, and E-fate safety evaluations. | Half-life >2-3 weeks |
| Photolysis | Degradation due to sunlight. Done in either soil or aqueous environment with radiolabeled chemical substance. | Half-life > 1 week (but this criterion is only important while the pesticide is on the surface) |

Table H.2

Environmental Fate and Transport Criteria

MOBILITY: Ability to move in air and/or potentially leach into ground water. This potential is altered by the compound's persistence.

| MOBILITY | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <u>Measure (Potential Utility)</u> | <u>Comment</u> | <u>Regulatory Endpoint</u> |
| Volatility, Henry's Law Constant | Calculated by the ratio of the chemical's vapor pressure to its solubility in water. Indicator of volatilization potential when pesticide is dissolved in water. | $< 10^{-2}$ atm-m ³ /mol |
| K _d , K _{oc} K _d is soil-specific. K _{oc} is normalized to % organic carbon (oc) in soil, the component most responsible for sorption. | Tendency of a chemical to be sorbed to soil. | K _d <5 and usually less than 1 to 2. Can vary widely depending on the soil type. K _{oc} <300 to 500 |
| Ground Water Ubiquitous Score or (GUS) | Empirical evaluation GUS = log soil 1/2 life x (4 - log K _{oc}). (Log soil half life) | <1.8 is improbable leacher, 1.8 - 2.8 is transitional zone, and >2.8 is a probable leacher. |
| Aged Soil Column Leaching | Lab experiment to estimate the leaching potential of parent and significant soil metabolite(s) in various soil types. | No quantitative trigger. Presence of parent and/or metabolites in the column leachate indicates potential to contaminate ground water. |
| Terrestrial Field Dissipation Studies | The rate of dissipation of the pesticide after application. Measures soil degradation in the environment (various soils). Expensive, long-term and involved. | Half Life of 2 to 3 weeks is considered persistent, and detection at 90 cm (30 inch) indicates leaching |

Table H.3

Environmental Fate and Transport Criteria

BIOACCUMULATION: The capacity of a chemical to accumulate (be stored in the tissue) in an organism as a result of uptake from all environmental sources.

| BIOACCUMULATION | | |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| <u>Measure (Potential Utility)</u> | <u>Comment</u> | <u>Regulatory Endpoint</u> |
| Octanol Water Partition Coefficient (K_{ow}) | Ability of a chemical substance to partition between an aqueous and lipid phase. Classic and easy measure which is used as an indication of a chemical's potential for bioconcentration by aquatic organisms. | $\log K_{ow} > 3$ indicates that the substance has the propensity to accumulate in fat. |
| Bioaccumulation Factor (BCF) | Used to help assess risks to fish and to non-target organisms (including humans) above them in the food chain. During an accumulation test, at any time during the uptake phase, the concentration of test substance (in ppm) in/on fish, or specified tissues thereof, divided by the concentration of the chemical in the surrounding medium = BCF. BCF tests are required for chemicals that have $\log K_{ow}$ values >3.0 . Remediation required if EPA water branch finds pesticide or chemical at certain levels in fish during random sampling. | $BCF > 1000$ |
| Animal Metabolism | This is part of mammalian toxicology, but information on metabolism and excretion can be useful to flag potential for bioaccumulation. Uses radiolabeled material. Excretion of 90%+ of all compound in the first 24 hours is desirable. | |

- 1 1. The bioaccumulation potential is considered significant if the substance has a log K_{ow} of 3 and triggers a fish
- 2 bioaccumulation test.
- 3

Literature Cited

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- U.S. EPA Draft Waste Min., "Where to Begin?," *Recommendations of the Waste Minimization Prioritization Team on Risk-based Tools for Identifying Priority Chemicals and Wastes*, Appendix C, July 1996.
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- Wiley, J., D.H. Hutson, T.R. Roberts et al., "Progress in Pesticide Biochemistry and Toxicology," *Environmental Fate of Pesticides*, 7, 1990, pp. 13-25.